

Stress and Emotional Reactivity as Explanations for Gender Differences in Adolescents' Depressive Symptoms

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Abstract In this longitudinal study, we examined whether certain types of stressful events and how individuals respond to these events would explain gender differences in depressive symptoms among adolescents. We hypothesized that certain stressful events would mediate the relationship between gender and depressive symptoms. We also hypothesized that individual differences in emotional reactivity would impact part of this relationship. Lastly, we examined whether gender differences in early childhood temperament might explain gender differences in emotional reactivity in adolescence. We examined these hypotheses in a sample of 315 adolescents (51% females; 93% Caucasian; 3% African–American; and 1% each Hispanic, Asian–American, and Native American) participating in a longitudinal study of child development since birth. We used multiple regression and constrained non-linear regression to analyze the data. Results indicated that stressful events significantly mediated gender differences in depression, and that individual differences in emotional reactivity to these stressors significantly moderated the relationship between stress and depression. We also observed significant gender differences in emotional reactivity to these stressors; temperamental differences in withdrawal negativity in infancy were marginally significant in mediating gender differences in emotional reactivity to stress in adolescence.

Keywords Gender · Depression · Adolescence · Emotional reactivity

Research has consistently demonstrated that rates of depression increase dramatically during adolescence. Before age 11, <1% of children experience an episode of depression, but by age 18, 20% of youth have experienced at least one depressive episode (Kessler et al. 1993). Gender differences in depression also emerge during adolescence. Research has shown that before age 11, slightly more boys are depressed than girls. However, by age 18, 27% of females have experienced at least one depressive episode whereas only 14% of males have (Costello et al. 2003; Hankin et al. 1998). Although the developmental trajectory of gender differences in depression has been firmly established, it remains less clear which factors may be contributing to gender differences for this disorder.

Hyde and colleagues posited in their recent affective-biological-cognitive (ABC) model of depression that gender differences in depression may be best understood from the framework of a general vulnerability-stress model, in which gender differences in vulnerability and/or stress may explain the emergent gender differences in depression (Hyde et al. 2008). Among the many hypotheses proposed within the ABC model, two specific hypotheses regarding potential explanations for gender differences in depression form the basis for the current study. First, the ABC model hypothesized that gender differences in stressful events, specifically in the domain of interpersonal stressful events, may partially mediate gender differences in depression. Second, Hyde and colleagues hypothesized that individual differences in affective vulnerability, defined predominantly as temperamental differences in negative emotionality, would predict greater emotional reactivity to stress and thus moderate the

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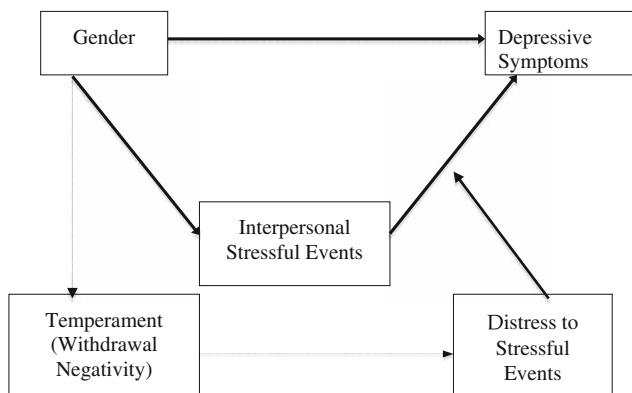


Fig. 1 Hypothesized model between gender, interpersonal stress, temperament, distress, and depressive symptoms

relationship between stress and depression. They further hypothesized that girls may display a greater emotional reactivity to stress than boys, and that this gender difference in emotional reactivity may be linked to gender differences in temperament present early in life. The purpose of the current study as presented in Fig. 1 is to test these hypotheses by examining whether gender differences in the frequency of stressful events in the interpersonal domain and/or emotional reactivity to those particular stressful events may explain gender differences in depression among adolescents.

Gender Differences in Stress

The occurrence of stressful events is nearly universal—be it a threat to physical safety, the end of a relationship, or getting a bad grade in school. One potential explanation for gender differences in depression is that females experience more stressful events than males (Hankin and Abramson 2001; Hyde et al. 2008). Yet researchers have examined whether gender differences in stressful events mediate gender differences in depression with mixed results. For example, the results of some studies suggest that adolescent girls do experience more stress than adolescent boys (Allgood-Merten et al. 1990; Davies and Windle 1997; Ge et al. 1994). However, other studies have failed to find significant gender differences in total stress among adolescents (e.g., Hankin et al. 2007). Hyde and colleagues (2008) noted that even among studies demonstrating statistically significant gender differences in total stress, the mean effect sizes have been quite small relative to the effect sizes typically seen in gender differences within the field of stress and depression; e.g., Davies and Windle (1997) reported a mean gender difference in adolescent stress of only $d = .12$. In a meta-analysis of studies conducted on gender differences in stress, Davis et al. (1999)

similarly concluded that females report only marginally higher levels of stress than do males.

These mixed findings may be due in part to the type of stressful events that have been included in examinations of gender differences in depression. Previous research has suggested that the presence or magnitude of gender differences may vary across stressor domain. Of particular interest is the domain of interpersonal stress. There is now consistent evidence that girls report more interpersonal stressors than boys (Prinstein and Aikens 2004; Rudolph and Hammen 1999; Shih et al. 2006). In a study of adolescents, Hankin et al. (2007) found that girls reported significantly more interpersonal, romantic, and peer stressors than boys, but no more achievement or school stressors; the effect size for the gender difference in interpersonal stressors was $d = .48$ (girls reporting more stressors than boys), while the gender difference for achievement stressors was $d = .16$ (boys reporting more stressors than girls). Taken together, these results suggest that previous mixed findings may have been due in part to the examination of stressors across all domains. As such, in the current study, we focused on the frequency of stressful events in the interpersonal domain only.

Gender Differences in Emotional Reactivity to Stress

Extensive research has now suggested that the relationship between stress and depression may itself be moderated by other vulnerability factors. One such vulnerability is individual differences in emotional reactivity to stressful events, which encompasses the intensity and negativity of emotional reactions that an individual experiences with the occurrence of a stressful event. Depression researchers have found that subjective appraisals of the perceived aversiveness of stressful events are equally, if not more, important than the frequency or level of stressful events in predicting depression (Abramson et al. 1989; Chang 2002; Smith et al. 1993; Wagner et al. 2007). For example, in a study of both young adults and older adults, Chang (2002) found that individuals who were more upset by unexpected life events had higher psychological symptoms and lower life satisfaction than those who were not as upset by stressors. In sum, the results of these studies suggest that emotional reactivity to stress may be an important moderator of the relationship between the experience of stress and the development of depression.

There is also some evidence that gender differences in emotional reactivity to stress may contribute to gender differences in depression. Some studies have shown that adolescent girls may experience higher negative emotional reactions to stressful events than do males (Hampel and Petermann 2006; Rudolph 2002). Hankin et al. (2007)

found that adolescent girls reacted more strongly to stress in the form of elevated depressive symptoms than did adolescent boys. Others have found that gender differences in emotional reactivity may also be domain specific; for example, girls report more subjective distress to negative peer events than to negative events in other domains (Crick et al. 2002; Prinstein et al. 2005). While previous research has examined gender differences in emotional reactivity, emotional reactivity to stressful events has not been explicitly studied as a separate vulnerability factor for the development of depression.

Although previous research supports a link between gender and emotional reactivity to stress, the origins of this gender difference in emotional reactivity remain to be explored. Consistent with Hyde et al. (2008), we hypothesize that gender differences in emotional reactivity to stress in adolescence may represent pre-existing gender differences in temperament. Temperament has been conceptualized as a trait-like affective vulnerability factor for depression, which may lead to greater emotional reactivity in times of stress (Carson and Bittner 1994; Hyde et al. 2008; Mezulis et al. 2006). Temperament is typically conceptualized as an emotional and behavioral style with biological roots that is stable over time (Compas et al. 2004).

In particular, the constructs of high withdrawal and high negative emotionality have been identified within the broad construct of temperament as particularly relevant to depression (Clark et al. 1994; Compas et al. 2004). In a longitudinal study examining the stability of temperament, Caspi and Silva (1995) found that temperament measured at age three was a good predictor of personality at age 18. Specifically, these researchers found that the children rated at age three as the most irritable, distracted, and emotionally labile were also highest in negative emotionality at age 15. In a subsequent study, they also found that negative emotionality at ages 15, 18, and 21 was significantly related to both concurrent and subsequent depressive symptoms (Krueger et al. 1996). Temperament in children has also been found to be significantly correlated with individual differences in responses to stress (Carson and Bittner 1994). Researchers have also found that children with temperaments high in negative emotionality respond to stress with more intense negative emotion and are more distressed by negative stimuli (Belsky et al. 1998). However, little research has attempted to model the relationship of temperament with emotional reactivity to stress, let alone as a potential explanation of gender differences in depression. In the current study, we examine temperamental differences in withdrawal negativity as assessed in infancy as a predictor of adolescents' emotional reactivity to stressful life events.

The Current Study

Previous research has indicated that, among the various types of stress, stressors in the interpersonal domain may be the most salient in the relationship between gender, stress, and depression. In this study, we examined gender differences in interpersonal stressors as a potential mediator of gender differences in depression. Past literature also indicated that the emotional reactivity to stressful events might play an important role in the relationship between stress and depression. As such, we examined emotional reactivity to interpersonal stressors as a moderator of the stress–depression relationship. Finally, we predicted that temperamental differences in withdrawal negativity in infancy would mediate the relationship between gender and emotional reactivity to interpersonal stressful events in adolescence. Figure 1 illustrates our hypothesized model.

We expected to find, as in other studies, that depressive symptoms and interpersonal stress would be higher for females than males. We also examined the following three questions. First, do stressful interpersonal events mediate the relationship between gender and depressive symptoms? Second, is emotional reactivity in response to stressful interpersonal events a moderator of the relationship between stress and depressive symptoms? Third, are there gender differences in emotional reactivity to stressful interpersonal events and, if so, does temperament mediate the relationship between sex and emotional reactivity to stressful interpersonal events?

Method

Participants

This study included a total of 315 children (49% male) and mothers who have participated in a longitudinal study of child development and family well being since birth. Mothers were recruited during pregnancy for participation in the Wisconsin Maternity Leave and Health Project, now named the Wisconsin Study of Families and Work (Hyde et al. 1995). Approximately 78% of the sample was recruited from the Milwaukee area and the remaining 22% came from the Madison area. The current study included all participants from the original sample who participated in the relevant assessments when children were 1 year old and again when children were 15 years old. Approximately 93% of the participants were Caucasian, 3% were African American, 1% were Native American, 1% were Hispanic, and 1% were Asian American.

Procedure

As part of the ongoing Wisconsin Study of Families and Work project, mothers and youth completed questionnaires during regularly scheduled in-home assessments. Parents provided consent and children provided assent for their participation. When the children were 1 year of age, mothers provided reports on their child's temperament. Adolescents completed the stress measures for this study on a laptop computer during an in-home visit when they were 15 years old.

Measures

Infant Temperament

Child temperament at age one was measured using the infant behavior questionnaire (IBQ; Rothbart 1981, 1986), which mothers had filled out when the children were 1 year of age. The IBQ is a structured parental report questionnaire that consists of items such as "How often did your baby fuss, cry, or show distress while waiting for food?" Mothers reported on each item from the previous 2 weeks on a 7-point Likert scale ranging from 1 (*never*) to 7 (*always*). We used the Withdrawal Negativity subscale, consisting of 21 items designed to measure fear/distress to novelty and startle. We averaged the items to yield a score of the child's overall withdrawal negativity. In the current sample, the internal consistency of the Withdrawal Negativity subscale was .76.

Stressful Interpersonal Events

Stressful interpersonal events were assessed at age 15 using a shortened version of the young adolescent version of the adolescent perceived events scale (APES; Compas et al. 1987). The full APES consists of 210 items and was originally developed using a broad set of stressful events generated by adolescents, and the final pool of items was shown to be representative of typical youth experiences. The 2-week test–retest reliability ranged from .77 to .85 (Compas et al. 1987). In the current study, youth were administered a shortened APES consisting of 59 items representing both major and daily life events. Youth were asked to indicate which events they had experienced in the previous 12 months. From these items, 28 items were identified by the authors as representing stressors in the interpersonal domain, defined operationally as stressors involving relationships with another person. Examples of such interpersonal stressors are: "fight with a friend," "problems with a family member," and "being pressured by friends." We created a count of the number of stressors endorsed in the interpersonal domain.

Emotional Reactivity to Stressful Interpersonal Events

Emotional reactivity to stressful interpersonal events was also assessed with the APES at age 15. For each item endorsed, participants were then asked to rate how subjectively negative or positive the event was on a 9-point Likert scale ranging from -4 (*extremely bad*) to 0 (*neither good nor bad*) to $+4$ (*extremely good*). Previous literature suggests that it is specifically negative emotional reactions to stressful events that are influential in the relationship between stress and depression. Thus, we created an index of subjective negative reactivity for each event by rescaling the responses such that scores of 1–4 represented *somewhat bad* to *extremely bad*, and 0 represented the range of neutral or positive responses. We then summed participants' negative reactivity scores for all interpersonal events and divided that number by of the total count of interpersonal stressful events to yield an average score for negative emotional reactivity to stressful interpersonal events.

Depressive Symptoms

Youth depressive symptoms were assessed with the Children's Depression Inventory (CDI; Kovacs 1985), which was completed by youth at age 15. The CDI is a 27-item self-report inventory that inquires about the presence of depressive symptoms in the previous 2 weeks. The CDI was designed for use with children between ages 8 and 17. Total scores on the CDI can range from 0 to 54, with higher scores indicating more severe symptom levels. In the current sample, alpha for depressive symptoms was .86.

Results

Data Analytic Plan

To test our meditational hypotheses, we used hierarchical linear regression and examined the results using the product of coefficients test recommended by MacKinnon et al. (2002). While the causal steps approach outlined by Baron and Kenny (1986) is useful for capturing large effect sizes and is the most widely used approach to test mediation, the product of coefficients test has superior power to detect small effect sizes and has the lowest probability for Type 1 error among the possible tests for mediation (MacKinnon et al. 2002). The product of coefficients test uses the path weights for each indirect pathway (e.g., from the predictor to the mediator, and from the mediator to the outcome variable) and the corresponding standard errors to compute the test statistic. This test statistic is then interpreted in relation to a standard normal distribution to evaluate the

significance of the mediator variable. The standard normal distribution is conceptualized as a bell shaped curve with a mean of zero and a standard deviation of 1. The most widely used cut-off values are +1.96, which represents the top 2.5% of the distribution, and -1.96, which represents the lower 2.5% of the distribution. Scores falling outside of these values, at the very ends of the curve, are interpreted as significant.

Our next research question addressed moderation of a mediated relationship. Traditionally, in order to test a moderated mediated relationship, researchers have divided collected data into “low” and “high” datasets according to the values of the moderator variable and then run separate mediational analyses to examine whether the moderator had a significant effect in either the low or high conditions. The major drawback to this method of analysis is that it makes meaningful statistical comparison between levels of the moderator nearly impossible.

Recent literature on statistics in the social sciences (Edwards and Lambert 2007) suggests that rather than conducting separate analyses to examine moderation of a mediated relationship, researchers should use formulas to examine the moderator and mediator simultaneously. In their 2007 article, Edwards and Lambert illustrated that is possible to examine a moderator directly within a mediated relationship by creating a reduced form regression equation that incorporates both the mediator and the moderator. This method allows the researcher to plug in different levels of the moderator to examine the effects on the mediated relationship. We used the reduced form regression equations obtained from Edwards and Lambert in order to evaluate the moderating effects of emotional reactivity within the second stage of the mediated relationship between gender and depression. The final combined mediated–moderated regression equation was produced by following four steps. First, we began by regressing the independent variable (gender) on the mediating variable (interpersonal stress). Second, we regressed the independent variable (gender), the mediator variable (interpersonal stress), the moderator variable (emotional reactivity), and a variable that is produced by multiplying the mediator and moderator variables on the dependent variable. Third, we substituted the regression weights and standard errors obtained from the first of these equations into the second equation to yield a reduced form equation. In this equation, the only “unknown” value is the value the moderator variable. In the fourth and final step, we then substituted different values of the moderator variable into the reduced form equation to view the effects on mediated relationship. This process allowed us to meaningfully compare the effects of differences in emotional reactivity within the mediated relationship.

Traditional tests of mediation rely on the assumption that the data are normally distributed (Edwards and Lambert 2007). However, because moderated mediated regression equations rely on the multiplication of coefficients, the assumption of normal distribution becomes tenuous at best. To overcome this difficulty, Edwards and Lambert recommend using a bootstrapping procedure. Bootstrapping involves random sampling with replacement from the original data set to create a sample of 1,000 coefficients, in effect smoothing out the data to meet the assumptions of normality. The functions of any spreadsheet program can then be used to estimate the confidence intervals around the results and pinpoint *t*-values and significance levels for the coefficients for each selected level of moderator within the mediated relationship. This method also allows for identification of the differences between levels of the moderator and determination if the differences are statistically significant. Consequently, we used constrained nonlinear regression on coefficients estimated from 1,000 bootstrap samples to test emotional reactivity as a possible moderator of the second stage of the mediated relationship between sex and depression.

Descriptive Analyses

Table 1 contains the means, standard deviations, *t*-tests, and effect sizes for gender differences for study variables. As expected, girls reported significantly more depressive symptoms than boys. Girls reported marginally more interpersonal stressors than did boys. Girls also reported greater emotional reactivity to interpersonal stressors than did boys. Mothers rated girls in this sample as significantly higher on withdrawal negativity in infancy than did mothers of boys. The correlations between variables for males and females are presented in Table 2.

Results of Mediation and Moderated Mediation Analyses

We used hierarchical linear regression to examine our first hypothesis that stressful interpersonal life events would mediate the relationship between gender and depressive symptoms. We began by calculating the relationships between each of the measures to determine if there were significant univariate relationships between them. Sex was a significant predictor of depression $F(1, 313) = 7.87, p = .005$ and a marginally significant predictor of interpersonal stressful events $F(1, 313) = 2.89, p = .090$. Interpersonal stressful events had a significant unique relationship to depression, $\Delta F(1, 312) = 32.93, p < .001$. When the frequency of interpersonal stressful events was entered as a mediator in the relationship between sex and depression, the relationship between sex and depression

Table 1 Descriptive statistics and gender differences for depressive symptoms, infant temperament, interpersonal stressful events, and emotional reactivity to interpersonal events

	Means (SD)		<i>t</i> -value	<i>p</i>	Cohen's <i>d</i>
	Boys	Girls			
Depressive symptoms, age 15	3.92(4.92)	5.62(5.76)	2.81	.005	.32
Withdrawal negativity, age 1	2.77(0.63)	2.98(0.68)	2.76	.006	.32
Interpersonal stressful events, age 15	5.93(3.57)	6.65(3.92)	1.70	.090	.19
Emotional reactivity to interpersonal events, age 15	1.28(0.81)	1.47(0.78)	2.11	.036	.24

Table 2 Correlations

	1	2	3	4
1. Depressive symptoms	–	.14	.41*	.34*
2. Infant withdrawal negativity	.06	–	.17*	.16
3. Interpersonal stress events	.46*	–.01	–	.31*
4. Emotional reactivity to interpersonal events	.42*	.07	.46*	–

Note: The correlation coefficients for males are presented above the diagonal. The correlation coefficients for females are presented below the diagonal. * $p < .05$

was reduced though still significant. Using the *B* weights and standard errors from the same regression equations used above, we calculated the product of coefficients using the Sobel test statistic. Results indicated that stressful interpersonal events were a significant mediator of the relationship between sex and depression, $z = 1.66$, $p = .047$. By comparing the standardized β weights for the relationship between gender and depression with and without the mediator, we calculated that stressful interpersonal events mediated 26% of the relationship between gender and depression. The unstandardized *B*-weights, standard errors, standardized β weights, and significance levels for the model are presented in Table 3.

To examine whether emotional reactivity moderated the relationship between interpersonal stress and depressive symptoms, we created a regression equation based on coefficients estimated from 1,000 bootstrap samples. This

Table 3 Regression coefficients for the test of mediation of the relationship between gender and depressive symptoms

Predictor	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Model 1					
Constant	3.92	.434			
Gender	1.70	.605	.157	2.81	.005
Model 2					
Constant	.25	.584			
Gender	1.25	.549	.116	2.28	.023
Stressful interpersonal events	.62	.073	.430	8.48	.000

allowed us to simultaneously examine the model at low (one standard deviation below the average) and high (one standard deviation above the average) levels of emotional reactivity. Because we used the same data and the same regression equations, we were also able to directly compare the low and high emotional reactivity models to each other in order to determine whether the differences between the two models were significantly different. Results indicated that emotional reactivity was a significant moderator of the relationship between interpersonal stress and depression, $t(1314) = 3.39$, $p < .001$. At low levels of emotional reactivity, there was not a significant relationship between the mediator, stressful interpersonal events, and the outcome, depressive symptoms, $t(1314) = .638$, $p = .523$. At high levels of emotional reactivity, there was a significant relationship between stressful interpersonal events and depressive symptoms $t(1314) = 6.07$, $p < .001$. Thus in this sample, our analysis indicated that emotional reactivity was a significant moderator of the second stage of the mediated relationship between gender, interpersonal stressful events, and depression; as emotional reactivity increased, the relationship between stressful interpersonal events and depressive symptoms grew stronger.

Lastly, to examine temperamental differences in withdrawal negativity in infancy as a mediator of the relationship between gender and emotional reactivity, we began by calculating the relationships between each of the measures to determine if there were significant univariate relationships between them. Gender was a significant predictor of withdrawal negativity in infancy $F(1, 297) = 7.60$, $p = .006$ and a significant predictor of emotional reactivity in adolescence $F(1, 297) = 5.56$, $p = .019$. Withdrawal negativity in infancy had a significant unique relationship to emotional reactivity in adolescence, $\Delta F(1, 296) = 3.66$, $p = .057$. When withdrawal negativity in infancy was entered as a mediator in the relationship between gender and emotional reactivity in adolescence, the relationship between gender and emotional reactivity in adolescence was reduced though still significant. Using this information, we calculated the product of coefficients using the Sobel test statistic. Results indicated that temperament was a marginally significant

Table 4 Regression coefficients for the test of mediation of the relationship between gender and emotional reactivity

Predictor	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>p</i>
Model 1					
Constant	1.27	.065			
Gender	.216	.092	.136	2.36	.019
Model 2					
Constant	.900	.203			
Gender	.188	.092	.118	2.036	.043
Temperament	.133	.069	.111	1.912	.057

mediator of the relationship between gender and emotional reactivity, $z = 1.58$, $p = .057$. By comparing the standardized β weights for the relationship between gender and emotional reactivity with and without the mediator, we calculated that temperament mediated 13% of the relationship between gender and emotional reactivity. The unstandardized *B*-weights, standard errors, standardized β weights, and significance levels for the model are presented in Table 4.

Discussion

At the beginning of our investigation, we hypothesized that gender differences in stress, in the domain of interpersonal stressful events, would help explain the strong link between gender and depressive symptoms in adolescence. As expected, in our sample of 15-year-olds, gender was a strong predictor of depressive symptoms. Our results also indicated that there were marginally significant differences between adolescent girls and adolescent boys in the amount of stressful events reported in the interpersonal domain, and that this gender difference mediated a significant portion of the gender difference in depressive symptoms.

The results also suggested that emotional reactivity to stressful events at age 15 was a very strong moderator of the second stage of the mediated relationship, the path between stress and depressive symptoms. In our sample, we found that at lower than average levels of emotional reactivity, there was not a significant relationship between stress and depressive symptoms. However, at higher than average levels of emotional reactivity in response to stress, there was a very strong relationship between stress and depressive symptoms. This suggests that emotional reactivity to stress is an important moderator of the relationship between stress and depression; as emotional reactivity increases, the relationship between stress and depression strengthens. Our study supports a model in which stress is still a key to the development of depression. However, as previous research has suggested (Abramson et al. 1989;

Chang 2002; Wagner et al. 2007), our results add support to the existing evidence that individual differences in emotional reactivity are as important as stress in the development of depressive symptoms and may represent a unique affective vulnerability in the development of depression.

Our results also indicated that gender was a significant predictor of emotional reactivity; girls in this study were likely to report higher levels of subjective distress in response to stressors than were boys. We attempted to link this adolescent gender difference back to temperamental differences in withdrawal negativity in infancy, and found modest support for our hypothesis that the relationship between gender and emotional reactivity in adolescence would be mediated by temperamental differences in withdrawal negativity in infancy. It is perhaps most interesting that mother reports of infant temperament were strongly linked to adolescent self-reports of emotional reactivity 14 years later, a finding that adds support to the theory and research that temperament is a stable construct with predictive validity for emotional reactivity (Belsky et al. 1998; Caspi and Silva 1995). Our results support the hypothesis first posed by Hyde and colleagues in their ABC model, that there may be an affective vulnerability factor to depression that is indicated by temperamentally based differences in withdrawal negativity present in infancy and early childhood and manifest in adolescence as high emotional reactivity to stress.

Clinical Implications

The results of the current study point to several potential targets for clinical interventions for those working with adolescents. One such target is temperamentally based individual differences in emotional reactivity to stress, which our results suggest may be present even prior to adolescence. As such, emotional reactivity may be a vulnerability factor present prior to the onset of symptoms and itself be a target of prevention efforts. Our results also suggest that girls who are high in emotional reactivity may be at particularly elevated risk for developing depression. As such, emotional reactivity to stressful events may present an ideal target for intervention for adolescent females.

Limitations

Several limitations to the current study should be noted and inform future research. One drawback to this study is that the bulk of analyses relied on concurrent self-report data from adolescents. It is possible that youth who endorsed

more current depressive symptoms are more likely to report more stressors or greater emotional reactivity to recent stressors. Additionally, future studies should attempt to better operationalize the construct of emotional reactivity to stress. In the current study, we asked youth to subjectively assess how “good” or “bad” the event was for them; a stronger operationalization of this construct would be to explicitly ask youth to rate how emotionally upset or distressed they were by the event. However, we do note that some studies of “reactivity” to stress have operationalized this construct as the strength of the relationship between the stressor and subsequent depressive symptoms (see, e.g., Hankin et al. 2007), which does not allow for the construct of emotional reactivity as a vulnerability factor to depression to be evaluated separately from the outcome of depression. Here, we have made an initial attempt at such a distinction and hope that future studies continue to explore the relationship between affective vulnerability and depression with more rigorous assessments of affective vulnerability.

Additionally, as presented in the ABC Model (Hyde et al. 2008), we acknowledge that there are a myriad of pathways to depression. These pathways also overlap and interact, and there are many influential factors in the emergence of gender differences in depression such as pubertal timing, genetic predisposition, and cognitive vulnerability. In this study we have attempted to shed light on but one of many possible pieces to the puzzle of gender differences in depression.

Finally, it is important to note that our participants were 15 years old at the time of the study. As gender differences in depression continue to widen until at least age 18 (Hankin et al. 1998), some of our gender differences in key variables that were only marginal at age 15 may develop into more significant gender differences over time. We would expect to see such a trajectory only strengthen our results, but future studies should encompass the entire middle and late adolescent period.

Conclusion

These findings support the building consensus that there are many pathways to the gender differences in depression (Hyde et al. 2008). Although no one type of stressor, or any one particular vulnerability, can completely explain the link between gender and depression, research on unique pathways can be used to develop specific interventions. For example, the results from this study indicate that temperament, specifically withdrawal negativity, may be an especially important factor in the developmental trajectory of depression for females, and may be manifest in

adolescence as strong emotional reactivity to stress. As such, temperament or emotional reactivity might be incorporated into screening tools to identify those children and adolescents, especially females, who might benefit the most from early intervention efforts to prevent the first onset of a depressive episode.

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